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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,375	09/21/2004	Kazushige Ohno	259205US90PCT	4117

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EXAMINER	
BOYER, RANDY	

ART UNIT	PAPER NUMBER
1797	

NOTIFICATION DATE	DELIVERY MODE
04/16/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)
	10/507,375	OHNO ET AL.
	Examiner	Art Unit
	RANDY BOYER	1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 8-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 8-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date:

17 September 2008 and 23 March 2009.

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges Applicant's response filed 26 January 2009 containing amendments to the claims and remarks.

2. Claims 1-6 and 8-12 are pending.

3. The previous rejections of claims 1-6 and 8-12 under 35 U.S.C. 103(a) are withdrawn in view of Applicant's arguments and Examiner's reconsideration of the record.

4. New grounds for rejection of claims 1-6 and 8-12 are entered under 35 U.S.C. 103(a). The rejections follow.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1-6 and 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (US 3,991,254) in view of Iseli (US 4,503,128) and Clough (US 5,326,633), and further in view of Lange (US 4,166,147) and Pitcher (US 4,417,908) and/or Abthoff (US 4,667,469). Alternatively, claims 1-6 and 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (US 3,991,254) in view of Iseli (US 4,503,128) and Clough (US 5,326,633), and further in view of Lange (US 4,166,147) and Pitcher (US 4,417,908) and/or Abthoff (US 4,667,469), as evidenced by Sakashita (JP 06239656 A).

9. With respect to claim 1, Takeuchi discloses an insulating structure for the purification of an exhaust gas comprising a porous ceramic carrier (520) that is "honeycomb-shaped" (see Takeuchi, column 3, lines 58-61), thus having a partition wall and a plurality of through-holes extending in a longitudinal direction of the porous ceramic carrier, the partition wall portion partitioning the through-holes.

Takeuchi does not disclose wherein the insulating structure further comprises a catalyst coat layer comprising at least one oxide ceramic and a catalyst active component and coating the porous ceramic carrier, the catalyst coat layer further comprising (a) a first substance having a thermal conductivity higher than the oxide ceramic, (b) a second substance having a refractive index larger than a refractive index of the oxide ceramic, or (c) a colored pigment; and wherein the porous ceramic carrier has a porosity of 40 – 80 % and a thermal conductivity of a porous ceramic carrier and the catalyst coat layer is 0.3-60 W/mK. In addition, Takeuchi does not disclose wherein the insulating structure is configured to filter particles in an exhaust gas

However, Takeuchi discloses wherein the insulating structure further comprises a heat insulating ceramic layer (c) surrounding the porous ceramic catalyst (520), wherein the heat insulating ceramic layer is porous and has a thermal conductivity in the range of 0.3 – 0.6 kcal/mH°C (see Takeuchi, column 5, lines 40-45). Moreover, Iseli discloses cordierite-based spray coatings which are highly porous, thermally shock resistant, low in thermal conductivity, and provide well-adhered oxides having excellent abradable and erosion resistant properties (see Iseli, column 2, lines 1-10). Iseli explains that such coatings are compatible for use with other ceramics (see Iseli, column 3, lines 18-20), and are particularly useful in high temperature, high erosivity environments (e.g., that encountered by the insulating structure of Takeuchi) (see Iseli, column 3, lines 36-39). In addition, Iseli notes that the porosity of the coating layer can be controlled by the method of application (see Iseli, column 4, lines 20-34), and that porosity is directly related to thermal conductivity (see Iseli, column 1, lines 44-47). Likewise, Clough

discloses the coating of monolithic catalyst substrates (e.g. the porous ceramic carrier (520) of Takeuchi) used in the catalytic conversion of combustion gases (see Clough, column 18, lines 50-54; column 19, lines 15-28; column 20, lines 44-46, 54-57, and 62-64; and column 21, lines 5-9). Clough explains that the porosity of such substrates, typically in the range of 10% to 65% (see Clough, column 21, lines 45-51), can be controlled. Clough notes that the thermal conductivity of the monolithic substrate can be reduced in magnitude by up to 90% compared to non-porous supports by optimizing the degree of porosity (see Clough, column 21, lines 59-68). In addition, Lange discloses the formation of an aqueous mixture or sol of titania which is shaped and fired into solid forms (see Lange, column 1, lines 14-19), and used for filtering applications and as catalyst supports (e.g. the porous ceramic carrier (520) of Takeuchi) (see Lange, column 10, lines 22-27). Lange explains that the precursor titania mixture is particularly useful for applications requiring high strength and high reflectivity in a high-temperature environment (e.g., that encountered by the insulating body of Takeuchi) (see Lange, column 1, lines 44-48). Finally, Takeuchi discloses the use of his insulating structure for the purpose of removing harmful components (e.g., carbon monoxide, nitrogen oxides) from the high-temperature exhaust gas of an internal combustion engine (see Takeuchi, column 14, lines 1-21). Takeuchi does not otherwise disclose the use of his insulating structure for the removal of soot or particulate matter in the exhaust gas. However, it is known in the art that exhaust gas from internal combustion engines contains at least some level of particulate matter (soot) that is a known environmental pollutant and harmful to human health (see Pitcher, column 10, lines 16-21) (see Abthoff, column 1,

lines 5-12). In this regard, it is likewise known in the art (as evidenced by Pitcher and Abthoff) to plug opposing ends of a porous honeycomb structure (e.g., that used in Takeuchi) placed in the flow path of an exhaust gas stream as a means of filtering and removing the particulate matter in the exhaust gas.

Therefore, the person having ordinary skill in the art would have been motivated to modify the insulating body of Takeuchi to provide for spray-coating of the porous ceramic carrier (520) with the titania sol of Lange as taught by Iseli, and varying the porosity of the catalyst coat layer (as taught by both Iseli and Clough) so as to provide a porous ceramic carrier having a porosity of 40-80%, a thermal conductivity of 0.3-60 W/mK, and containing a substance having a refractive index greater than that of the oxide ceramic; the coat layer comprising an oxide ceramic (e.g. alumina as taught by Iseli) and catalyst active component (e.g. rare earth oxides as taught by Iseli), and a substance having a refractive index larger than a refractive index of the oxide ceramic (e.g. titania as taught by Lange). Likewise, the person having ordinary skill in the art would have been motivated to plug opposing ends of the porous honeycomb carrier (520) of Takeuchi as a means of removing any harmful and polluting particulate matter expected to be in the exhaust gas stream.

Finally, the person having ordinary skill in the art would have had a reasonable expectation of success in modifying the insulating structure of Takeuchi as described above because: (1) Iseli, Clough, and Lange are all directed to materials for use at high temperature and/or high erosive environments (e.g., that encountered by the insulating body of Takeuchi); (2) both Clough and Lange contemplate use of their respective

materials as a coating or composite material for catalyst supports (e.g., the porous ceramic carrier (520) of Takeuchi); (3) Iseli notes the use of rare earth oxides in his coating material as a means of varying the chemical properties of the coating (e.g., with the rare earth oxide serving as a "catalyst active component"); and (4) both Pitcher and Abthoff disclose plugging selected ends of a honeycomb structure (e.g., the porous ceramic carrier (520) of Takeuchi) as a means of filtering and removing harmful and polluting particulate matter found in the high-temperature exhaust gases of internal combustion engines.

10. With respect to claim 2, both Iseli and Clough disclose the change in porosity to affect thermal conductivity. In addition, Clough discloses the optimization of thermal conductivity by varying porosity (see discussion *supra* at paragraph 9).

11. With respect to claim 3, Iseli discloses a coating layer made, in part, of alumina and silica (see Iseli, column 2, lines 39-42).

12. With respect to claim 4, Iseli discloses that additives may be included to change the chemical properties (e.g. catalyst activity) of the coating (see Iseli, column 3, lines 9-13), while Clough discloses the use of catalyst components such as gold, silver, and copper as coating additives (see Clough, column 20, lines 27-43).

13. With respect to claim 5, Iseli discloses wherein the coating layer contains a rare earth oxide (see Iseli, column 2, lines 48-51).

14. With respect to claim 6, Takeuchi discloses wherein the ceramic insulating layer is cordierite (see Takeuchi, column 1, lines 67-68; and column 2, lines 1-3).

15. With respect to claim 8, Takeuchi discloses wherein the thermal conductivity is 0.3 kcal/mH°C (0.35 W/mK). In addition, both Iseli and Clough disclose the change in porosity to affect thermal conductivity. In addition, Clough discloses the optimization of thermal conductivity by varying porosity (see discussion *supra* at paragraph 9).

16. With respect to claims 9, 11, and 12, Lange discloses a titania sol with iron oxide as a pigment to form a refractory body (see Lange, column 3, lines 11-20 and 25-31), wherein the refractory turns black in color upon reduction in a hydrogen environment (see Lange, column 3, lines 25-31).

17. With respect to claim 10, Lange discloses wherein the shaped and fired refractory is in the form of rutile titanium dioxide (see Lange, column 6, lines 4-31). Rutile titanium dioxide is known in the art to have a peak in a portion that a reflectance against an electromagnetic wave of not less than 10 μm is not less than 70% (see e.g., Sakashita (JP 06239656 A), English machine translation at page 5, paragraph [0008]).

18. Claims 1-6, 8, 9, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe (US 5,340,548) in view of Clough (US 5,326,633) and Lange (US 4,166,147).

19. With respect to claims 1-6 and 8, Abe discloses a filter for the purification of an exhaust gas (see Abe, Abstract) comprising: (a) a porous ceramic carrier that may be in the form of a honeycomb-type ceramic filter (and a partition wall and through-holes) (see Abe, column 1, lines 34-35) configured to filter particles in an exhaust gas (see Abe, column 2, lines 13-18); and (b) a catalyst coat layer provided on the porous ceramic carrier (e.g., alumina, titania, silica) (see Abe, column 4, lines 5-11) and

comprising a catalyst active component (e.g., alkali metal, rare earth oxide) (see Abe, column 3, lines 60-64; and column 5, lines 25-27), the catalyst coat layer further comprising copper (see Abe, column 3, lines 60-64); and wherein the porous ceramic carrier has a porosity of 40-80% (see Abe, column 3, line 16).

Abe does not explicitly disclose wherein the filter body comprising the porous ceramic carrier has a thermal conductivity in the range of 0.3-60 W/mK; or wherein the catalyst coat layer comprises a second substance having a refractive index larger than that of the oxide ceramic.

However, Clough discloses the coating of monolithic catalyst substrates used in the catalytic conversion of combustion gases (see Clough, column 18, lines 50-54; column 19, lines 15-28; column 20, lines 44-46, 54-57, and 62-64; and column 21, lines 5-9). Clough explains that the porosity of such substrates, typically in the range of 10% to 65% (see Clough, column 21, lines 45-51), can be controlled. Clough notes that the thermal conductivity of the monolithic substrate can be reduced in magnitude by up to 90% compared to non-porous supports by optimizing the degree of porosity (see Clough, column 21, lines 59-68). In addition, Lange discloses the formation of an aqueous mixture or sol of titania which is shaped and fired into solid forms (see Lange, column 1, lines 14-19), and used for filtering applications and as catalyst supports (see Lange, column 10, lines 22-27). Lange explains that the precursor titania mixture is particularly useful for applications requiring high strength and high reflectivity in a high-temperature environment (see Lange, column 1, lines 44-48), including as a reinforcement for ceramic composite material (see Lange, column 11, lines 8-13).

Therefore, the person having ordinary skill in the art would have been motivated to modify the filter of Abe so as to control the degree of porosity in the ceramic carrier in relation to its thermal conductivity in order to achieve a structure with low thermal conductivity and increased heat resistance in the high temperature environment encountered in treating engine exhaust gas. Likewise, the person having ordinary skill in the art would have been motivated to modify the filter of Abe to include a coating of titania precursor (as taught by Lange) in order to provide a reinforced structure with structure with increased durability.

Finally, the person having ordinary skill in the art would have had a reasonable expectation of success in modifying the filter of Abe as described above because: (1) Abe discloses the use of honeycomb structural bodies for the porous ceramic carrier; (2) Abe expresses a concern for providing a filter with excellent heat resistance; (3) Clough discloses that the porosity of multi-channel monoliths (honeycomb structures) may be controlled with a corresponding change in thermal conductivity of the ceramic; and (4) Lange discloses the use of his titania sol precursor as a means for reinforcing ceramic composites and as a catalyst support.

20. With respect to claims 9, 11, and 12, Lange discloses a titania sol with iron oxide as a pigment to form a refractory body (see Lange, column 3, lines 11-20 and 25-31), wherein the refractory turns black in color upon reduction in a hydrogen environment (see Lange, column 3, lines 25-31).

21. Claims 1 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe (US 5,340,548) in view of Clough (US 5,326,633) and Lange (US 4,166,147), as evidenced by Sakashita (JP 06239656 A).

22. With respect to claims 1 and 10, see discussion *supra* at paragraph 19. Lange discloses wherein the shaped and fired refractory is in the form of rutile titanium dioxide (see Lange, column 6, lines 4-31). Rutile titanium dioxide is known in the art to have a peak in a portion that a reflectance against an electromagnetic wave of not less than 10 μm is not less than 70% (see e.g., Sakashita (JP 06239656 A), English machine translation at page 5, paragraph [0008]).

Response to Arguments

23. Applicant's arguments filed 26 January 2009 have been fully considered but they are not persuasive.

24. Examiner understands Applicant's principal arguments to be:

I. The insulating layer of Takeuchi does not partition the through holes extending in a longitudinal direction of a porous ceramic carrier.

II. Takeuchi fails to disclose or suggest a catalyst coat layer provided in a partition wall portion of a porous ceramic carrier.

25. With respect to Applicant's first and second arguments, Examiner notes that claim 1 specifies: "the porous ceramic carrier having a partition wall portion and a plurality of through-holes, the through-holes extending in a longitudinal direction of the porous ceramic carrier, the partition wall portion partitioning the through-holes." In this

regard, Examiner notes that Takeuchi clearly discloses wherein the porous ceramic carrier is “honeycomb-shaped” (see Takeuchi, column 3, lines 58-61), thereby necessarily meeting the limitations with respect to having a partition wall portion and a plurality of through-holes in the carrier.

With respect to Applicant’s limitations regarding “a catalyst coat layer provided in the partition wall portion of the porous ceramic carrier,” Examiner notes that given Applicant’s definition of “partition wall portion” being a portion “partitioning the through-holes” of the porous ceramic carrier (see Applicant’s claim 1), then the outer surface of Takeuchi’s porous ceramic carrier would necessarily constitute a “partition wall portion” in the context of Applicant’s amended claim 1 since the outer surface would necessarily serve to “partition the through-holes” of the outermost radial region of Takeuchi’s honeycomb-shaped porous ceramic carrier. In this regard, the outermost radial region (“partition wall portion”) of Takeuchi’s honeycomb-shaped porous ceramic carrier would necessarily be covered with a catalyst coat layer as provided for in Examiner’s proposed combination (see discussion *supra* at paragraph 9). Moreover, Takeuchi provides that a catalyst metal is carried on the surfaces of the (honeycomb) exhaust gas passages, serving to purify the engine exhaust gas (see Takeuchi, column 13, lines 26-29).

26. The remainder of Applicant’s arguments is considered moot in view of the new grounds of rejection.

Conclusion

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 10:00 A.M. to 7:00 P.M. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB

/Glenn A Caldarola/

Acting SPE of Art Unit 1797